

LOUISIANA DEPARTMENT OF WILDLIFE & FISHERIES



OFFICE OF FISHERIES INLAND FISHERIES SECTION

PART VI -A

WATERBODY MANAGEMENT PLAN SERIES

LOWER PONTCHARTRAIN SUB-BASIN

CAERNARVON - DELACROIX / BAYOU BIENVENUE CENTRAL WETLANDS UNIT

SUB-BASIN HISTORY & MANAGEMENT ISSUES

CHRONOLOGY

DOCUMENT SCHEDULED TO BE UPDATED EVERY TWO YEARS

JANUARY 2010 - Prepared by

Melissa A. Kaintz, Biologist Manager, District 8

JANUARY 2012 – Updated by

Tim Ruth, Biologist Manager, District 8

AUGUST 2014 – Updated by

Tim Ruth, Biologist Manager, District 8

Gary Vitrano, Biologist Manager, District 8

AUGUST 2016 – Updated by

Gary Vitrano, Biologist Manager, District 8

TABLE OF CONTENTS

WATER BODY HISTORY	4
GENERAL INFORMATION	4
HYDROLOGY	5
AUTHORITY	6
ACCESS	7
State/Federal facilities	7
SHORELINE DEVELOPMENT	8
State/National Parks	8
EVENTS/PROBLEMS	8
Hydrological Changes	8
MANAGEMENT ISSUES	9
AQUATIC VEGETATION	9
Type map	9
Biological	10
Chemical	10
HISTORY OF REGULATIONS	11
Recreational	11
Commercial	12
FISH KILLS / DISEASE HISTORY, LMBV	12
CONTAMINANTS/POLLUTION	12
BIOLOGICAL	12
Fish samples	12
Lake records	14
Species profile	16
Genetics	17
Threatened/endangered/exotic species	17
CREEL	17
Historic information	17
WATER USE	18
Hunting	18
Fishing	18
Trapping	18
LITERATURE CITED	19
APPENDIX I	20
APPENDIX II	24
APPENDIX III	25
APPENDIX IV	28
APPENDIX V	30
APPENDIX VI	32
APPENDIX VII	37

WATER BODY HISTORY

GENERAL INFORMATION

The Lake Pontchartrain Basin is a watershed located in southeast Louisiana and southwest Mississippi that encompasses 19% (9700 square miles) of Louisiana's land area (LPBF 2006; [APPENDIX I](#), Figure 1.). Elevations in the basin range from more than 300 feet above sea level to more than 10 feet below sea level. The basin can be divided into multiple sub-basins in Louisiana. The northern half of the basin is commonly referred to as the Florida Parishes and it contains all or portions of seven parishes, which include East Baton Rouge, East Feliciana, Livingston, St. Helena, St. Tammany, Tangipahoa, and Washington Parishes. The Florida Parishes drain into many rivers introducing fresh water into Lakes Maurepas, Pontchartrain and Borgne. Many of these rivers have headwaters in Mississippi. The rivers of this basin have eroded and incised the uplands to form distinct river valleys. Lakes Maurepas, Pontchartrain and Borgne give way to shallow intermediate ponds and marshes which receive freshwater inputs from the Amite River, Tickfaw River, Blind River, Tangipahoa River, Bedico Creek, Tchefuncte River, Bayou Chinchuba, Bayou Castine, Cane Bayou, Bayou Lacombe, Bayou Liberty, and Bayou Bonfouca. Land use within this basin is varied, ranging from high-density urban areas to rural pastures and dairies in the Florida Parishes.

South of the Florida Parishes are the Coastal lowlands. The middle and lower Pontchartrain sub-basins are south or adjacent to Lakes Maurepas, Pontchartrain and Borgne, and include St. John the Baptist, St. Charles, Jefferson, Orleans, St Bernard and Plaquemines Parishes. Fresh water is introduced into the middle and lower sub-basins through regional drainage and the Mississippi River via spillways, siphons and diversions while salt water enters these lakes and marshes from the Gulf of Mexico via the Mississippi Sound, Chef Pass, Rigolets Pass and Breton Sound.

The Lower Pontchartrain Sub-Basin

The Lower Pontchartrain Sub-basin (LPSB) originated from two deltaic processes of the Mississippi River, the St. Bernard Delta Lobe which peaked in extent 2000-4000 years ago when it created a large delta and the modern delta known as the Plaquemines/Balize (LPBF 2006). It is bounded by the Gulf Intracoastal Waterway (GIWW), the Mississippi River, Breton Sound, Chandeleur Sound and the Mississippi Sound ([APPENDIX I](#), Figure 2) and can be divided into two disjointed inland management units, the Caernarvon - Delacroix unit and the Bayou Bienvenue Central Wetlands unit ([APPENDIX I](#), Figure 3 & 4).

Major Waterbodies:

Caernarvon / Delacroix

River Aux Chenes, Spanish Lake, Lost Lake, Petit Lake, Grand Lake, Lake Lery, Caernarvon Outflow Canal, Bayou Mandeville, Delacroix Canal, Back Levee Canal, Bohemia Spillway / Mardi Gras Pass

Bayou Bienvenue Central Wetlands

Bayou Bienvenue, Dike Canal, Bayou Ducros, Bayou Dupre, Violet Canal

HYDROLOGY

The LPSB has undergone significant hydrological changes, both natural and anthropogenic. Historically, the Mississippi River was the source of freshwater, nutrients and sediment for the sub-basin. The construction of Mississippi River main line levees ceased the input of freshwater and sediment. The construction of the Mississippi River Gulf Outlet (MRGO), the GIWW and the hundreds of miles of oil field canals plus natural processes such as subsidence and sea-level rise have increased saltwater intrusion and shoreline erosion. To mitigate for these changes, siphons and diversions have been constructed.

Caernarvon / Delacroix

The southern half of the system consists of tidally influenced marshes connected to large bay systems and Breton Sound. Freshwater sources are now limited to precipitation, municipal drainage, siphons and freshwater diversions. The White's Ditch Siphon, operational since 1977, the Bayou Lamoque Freshwater Structure, constructed in 1957, and the Bohemian Spillway Structure were functional prior to the construction of the Caernarvon Freshwater Diversion.

The Caernarvon Diversion Structure was constructed between 1988 and 1991, as part of the Caernarvon Freshwater Diversion Project (CFDP; BS-08). Operations began in August 1991 (LDNR 2003). The Diversion was created to artificially restore the connection between the river and the surrounding marshes. This connection delivers freshwater, nutrients, and sediments into the surrounding area to restore wetlands, build land, and enhance fisheries and wildlife production. The maximum allowable discharge of the structure is 8,000 cubic feet per second (cfs). The Diversion affects approximately 77,000 surface acres of surrounding marsh. Additional information regarding operations, maintenance, and monitoring of the CFDP (BS-08) can be found at the CPRA resources web site. <http://coastal.louisiana.gov/>. Instantaneous water data on the CFDP outfall can be obtained at the USGS Water Data for Louisiana website: [LA USGS Water Data](#)

In addition to the Caernarvon Diversion Structure, the outfall area plays an important role in the freshwater diversion system. The intent of the Caernarvon Diversion Outfall Management project (BS-03a) is to maximize the benefits from the Diversion to the marshes immediately south and west of Big Mar ([APPENDIX II](#), Figure 1) during periods of low discharge from the diversion structure. Prior to the BS-03a project, man-made spoil banks and plugs routed much of the water to the lower southwest reaches of the basin and did not inundate the interior marshes as originally intended. BS-03a project features, such as plugs, sluice and combination gates, and spoil bank restoration, were designed to allow water from the channels to flow into the marsh interior and be retained for a longer period of time. Sluice and combination gates operate by controlling the passage of water in an open channel, and when fully lowered will restrict water flow as desired. Increased retention time is needed in the interior marshes to facilitate the distribution of fresh water, deposition of suspended sediments, and assimilation of nutrients by the vegetation communities.

Bayou Bienvenue Central Wetlands

The Bayou Bienvenue Central Wetlands (BBCW) is a 28,202 acre semi-impounded wetland located between the Mississippi River, the MRGO and the GIWW. It is bounded by thirty eight miles of levee. Locks located at Bayou Bienvenue and Bayou Dupre provides connections to the tidally influenced MRGO, Lake Borgne and Biloxi Marshes. The Southeast Flood Protection

Authority controls the closure of these locks. Updates on lock closures can be found on the following website: <http://slfpae.com/closures.aspx>. Freshwater inputs into the system are now limited to precipitation, municipal drainage, 6 pumping stations along the Forty Arpent Canal and the Violet Siphon. Constructed in 1979, the Violet Siphon was implemented to prevent saltwater intrusion from the MRGO. It was designed to deliver up to 300 cfs of Mississippi River water through the Violet Canal.

AUTHORITY

The state of Louisiana has authority over the state owned water bottoms of the Pontchartrain Basin. A considerable portion of marsh in the LPSB is private property and manmade canals are considered private property of the landowner. Some, but not all, of these landowners still allow public access in their canals.

The basin is managed under the authority of these major programs:

Lake Pontchartrain Basin Foundation (LPBF) is dedicated to restoring and preserving the water quality, coast, and habitats of the entire Pontchartrain Basin. Through coordination of restoration activities, education, advocacy, monitoring of the regulatory process, applied scientific research, and citizen action, LPBF works in partnership with all segments of the community to reclaim the Basin for this and future generations. The Lake Pontchartrain Basin Foundation is a non-profit organization consisting of a 14-member board of directors representing Basin parishes and regulatory agencies. Complete details for LPBF can be found by visiting their website at: <http://saveourlake.org/index.php>

The Coastal Protection and Restoration Authority (CPRA) of Louisiana is mandated to develop, implement and enforce a comprehensive coastal protection and restoration master plan. This state authority integrates coastal restoration and hurricane protection statewide. The Pontchartrain Basin is located in the CPRA Southeast Region. Initially, CPRA was established as a board of directors by the 1st Extraordinary Session of the Louisiana Legislature of 2005. Act 545 of the 2008 Regular Session and Act 523 of the 2009 Regular Session provided the Board of Directors with an implementation arm. These Acts integrated the coastal restoration and flood protection division of the Department of Natural Resources (DNR) and the Department of Transportation and Development (DOTD), creating the Office of Coastal Protection and Restoration (OCPR) within the Executive Department. Act 604 of the 2012 Regular Session of the Louisiana Legislature formally changed the name from OCPR to CPRA. Complete details for CPRA, including the Louisiana 2012 Coastal Master Plan and specific plans for the Pontchartrain Basin can be found by visiting the CPRA website at: <http://coastal.louisiana.gov/>.

The Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) is federally mandated legislation enacted by the U.S. Congress in 1990 that is designed to identify, prepare, and fund construction of coastal wetlands restoration projects. These projects provide for the long-term conservation of wetlands and dependent fish and wildlife populations with cost-effective plans for creating, restoring, protecting, or enhancing coastal wetlands. In Louisiana, CWPPRA is often called the “Breaux Act” in honor of U.S. Senator John Breaux, who helped initiate the legislation. (Source: LaCoast.gov). Currently CWPPRA project BS-16 - South Lake Lery Shoreline and Marsh Restoration in Plaquemines Parish is in the construction phase. See

details at: <http://lacoast.gov/new/Projects/Info.aspx?num=BS-16>. Details for all CWPPRA's Pontchartrain Basin projects can be found by visiting the LaCoast website at: <http://lacoast.gov/new/Default.aspx>.

Caernarvon Freshwater Diversion Project

The CPRA is responsible for the Caernarvon Freshwater Diversion's maintenance and operation. The Caernarvon Interagency Advisory Committee (CIAC), which consists of 14 representatives from federal and state agencies, parish government, fisheries representatives, and landowners, also provides overall operational oversight. The advisory committee was established pursuant to a written agreement between the U.S. Army Corps of Engineers and CPRA and is to advise the Executive Director of CPRA relative to the operation of the structure. The actual amount of diverted flow depends on a detailed operational plan that is set by the CIAC every year and river stages in the Mississippi River. A technical work committee consisting of the U.S. Army Corps of Engineers and four State agencies was established to provide advice relative to the operation of the structure and collection, analysis, interpretation and reporting of monitoring data. The current 2016 Caernarvon operations will be based on the monthly salinity range at the 15 ppt line from December through May and based on the monthly salinity range at the 5 ppt line from June through November (see Caernarvon Freshwater Diversion Operational Plan 2016 – [APPENDIX III](#)).

ACCESS

There are numerous boat ramps and marinas located throughout the Lower Pontchartrain Sub-basin. Table 1 lists the most popular access locations within the sub-basin.

Table 1. List of popular boating access locations within the Lower Pontchartrain Sub-basin (See location map – [APPENDIX IV](#), Figure 1).

Name	Latitude	Longitude
Eddie's	29.99043°	-89.941706°
Bayou Bienvenue Marina	29.98276°	-89.94407°
Gulf Outlet Marina	29.97270°	-89.94518°
Violet Boat Launch	29.90085°	-89.894253°
Delacroix Land (Private Boat Launch)	29.86173°	-89.908701°
Reggio Marina	29.823512°	-89.756253°
Serigne	29.764197°	-89.791891°
Sweetwater Marina	29.761367°	-89.79102°
Beschel's Marina	29.569506°	-89.764979°

State/Federal facilities

St. Bernard State Park in St. Bernard Parish on Hwy. 39 offers camping and backpacking. There are no boat ramps in this park (<http://www.crt.state.la.us/parks/iStbernrd.aspx>).

SHORELINE DEVELOPMENT

State/National Parks

The St. Bernard State Park features a swimming pool, comfort station, bathhouse, restrooms, and a pavilion.

EVENTS/PROBLEMS

The Lower Pontchartrain Sub-basin is a complex and dynamic ecosystem. It is affected by both natural and anthropogenic disturbances.

2010 Deepwater Horizon Oil Spill

The 2010 *Deepwater Horizon* Oil Spill in the Gulf of Mexico was the nation's largest oil spill. Portions of the Lower Pontchartrain Sub-basin were affected by direct oiling and response activities.

Hurricanes and Tropical Storms

Multiple hurricanes have affected the LPSB; Hurricane Isaac in 2012, Tropical Storm Lee in 2011, Hurricanes Gustav and Ike in 2008, and Hurricanes Rita and Katrina in 2005. Salinity spikes and loss of aquatic vegetation due to wave energy are associated with these events. Hurricane Katrina caused considerable land loss and damage to the aquatic habitat in the Caernarvon – Delacroix area (APPENDIX IV, Figure 2).

Periodic hurricanes and tropical storms often interrupt natural regimes and disturb aquatic habitats in the basin. Widespread fish kills are associated with such events (see fish kills section). Management actions including bass restocking and protective regulations have been applied in an effort to enhance post-storm recovery. Evaluations of those actions indicate minor benefit. Coastal fish populations have adapted to these periodic storm events. Rapid recovery is a result of the natural selection process. The LDWF approach to storm related fish kills now includes the following approach. Fish kills will be defined through detailed investigation. Subsequent sampling will be conducted to evaluate natural recovery. If natural recovery is found to be insufficient, management action including restocking and/or harvest restrictions will be applied as needed.

Hydrological Changes

Caernarvon Freshwater Diversion Project

The operational plan for the CFDP is subjected to adaptive management practices and is set annually. The current 2016 Caernarvon operations will be based on the monthly salinity range at the 15 ppt line from December through May and on the monthly salinity range at the 5 ppt line from June through November (see Caernarvon Freshwater Diversion Operational Plan 2016 – Appendix III).

Mardi Gras Pass

In 2014, Mardi Gras Pass (MGP) was formally designated as a navigable waterway of the U.S. (also known as Mardi Gras Cut) by the U.S. Coast Guard (Lopez et al 2014). The MGP evolved

from a newly formed 630 foot long channel that crossed the crest of the Mississippi River's natural levee as a result of the Mississippi flood in May 2011. The channel eventually breached completely through to the river in March 2012. It is now a free-flowing distributary of the Mississippi River at RM 43.7 adjacent to the Bohemia Spillway structure. The MGP has the present capacity of 2,500 cfs and has influenced the salinity regimes of the LPSB. Hydrocoast maps of the current Pontchartrain basin salinity gradient can be obtained at the following website: [Save Our Lake Coastal Hydromap](#)

The Mississippi River Gulf-Outlet Closure

In 1956, Congress authorized the MRGO as a federal navigation channel. It is a 76-mile long manmade navigation channel built to provide a shortcut from the inner harbor area of the Port of New Orleans to the Gulf of Mexico. It was completed and fully operational in 1968. The MRGO interrupted the hydrology of natural waterways and breached an important hydrological boundary when the channel was cut through the ridge at Bayou La Loutre. Consequently, a significant habitat shift occurred as a result of saltwater intrusion. To mitigate for problems associated with saltwater intrusion in the BBCW, the violet siphon was constructed. The channel continued to contribute to the degradation of the surrounding wetlands in the system. Following Hurricane Katrina, Congress directed the USACE, New Orleans District, to develop a comprehensive plan to de-authorize deep draft navigation on the MRGO channel (USACE 2012). The MRGO was closed in July 2009 following the construction of a rock dam across the channel near Bayou La Loutre, thus eliminating a direct path for saline waters of the Gulf of Mexico into the interior marshes. As a result, salinity levels throughout the system have declined.

MANAGEMENT ISSUES

AQUATIC VEGETATION

Aquatic vegetation provides beneficial habitat for fish and wildlife throughout the wetland areas of the LPSB. However, invasive plants such as water hyacinth and giant salvinia have become overly abundant and problematic. In some portions of the sub-basin, freshwater plant species are restricted by salinity. Marsh grasses, *Spartina* spp. are dominant in these areas.

Type map

Vegetation type map surveys are conducted annually to determine abundance and species composition of aquatic vegetation in the LPSB ([APPENDIX V](#), Figure 2).

Bayou Bienvenue Central Wetlands

Vegetation mapping in BBCW has recently focused on the infestations of giant salvinia (*Salvinia molesta*). At its peak, the invasive plant pushed into marinas along Paris Road. The vegetation has interfered with navigation and commerce along the corridor. Approximately 800 acres of giant salvinia in the marsh east of Bayou Bienvenue to the Violet canal were documented during a November 2013 aerial survey ([APPENDIX V](#), Figure 1). Giant salvinia still persists in these areas; the population will fluctuate seasonally with its peaks in August and September.

Caernarvon / Delacroix

The most problematic vegetation in the Caernarvon outfall is water hyacinth. Coverage of this invasive species is 20% in some areas. Coontail, a beneficial submerged plant is the most dominant species with 20% - 80% coverage in some waterbodies. The Caernarvon / Delacroix area was surveyed for vegetation coverage in October 2015 (**APPENDIX V**, Figure 2).

Biological

Bayou Bienvenue Central Wetlands

Giant salvinia weevils (*Cyrtobagous salviniae*) have been introduced to control giant salvinia in the BBCW. LDWF, LSU AgCenter, and private land owners continue to cooperate to introduce the weevils throughout the wetland. A total of 66,040 adult giant salvinia weevils have been released to date since 2012

Tidal influences also function as a control measure for aquatic vegetation, as well as saltwater intrusions during tropical storms. A higher salinity regime in the fall reduces the giant salvinia population significantly.

Chemical

Caernarvon / Delacroix

LDWF spray crews treated 476 acres of water hyacinth (*Eichhornia crassipes*) around the Caernarvon / Delacroix 1 area since 2012 (Table 2). The herbicide 2,4-D is banned in Plaquemines Parish; therefore, glyphosate is utilized in that parish to control water hyacinth.

Bayou Bienvenue Central Wetlands

Giant salvinia has been the main focus in the Bayou Bienvenue Central wetlands. Spray crews apply herbicides in accordance with the approved LDWF Aquatic Herbicide Application Procedure. Giant salvinia is treated with a mixture of glyphosate (0.75 gal/acre) and diquat (0.25 gal/acre) with Turbulence (0.25 gal/acre) surfactant as needed. Since 2012, a total of 661 acres of aquatic vegetation were treated, 640 of which consisted of giant salvinia (Table 2).

Table 2. Acres Sprayed in the LPSB from 2012 – 2015.

		2012	2013	2014	2015	Total
Body of Water	Vegetation	Acres Sprayed	Acres Sprayed	Acres Sprayed	Acres Sprayed	Acres Sprayed
Bayou Bienvenue	Alligator weed		5			5
	Salvinia, Giant	141	329	170		640
	Water Hyacinth		16			16
Caernarvon	Water Hyacinth			297	110	407

	Salvinia, Giant				110	110
Lake Lery	Alligator weed			2		2
	Water Hyacinth			69		69
	Total	141	350	538	220	1249

HISTORY OF REGULATIONS

Statewide regulations for all freshwater species apply to the Caernarvon / Delacroix area.

Organized requests for trophy bass management of the Caernarvon / Delacroix area have been received. As part of an angler creel survey in 2000, 693 anglers were surveyed on the topic. Anglers were asked which largemouth bass regulations they would like for the area. Four choices were offered: minimum length limit, slot limit, reduced creel, other.

Results of the first 2 years of the survey indicated that 78.1% of anglers wanted a change in harvest regulations and only 10.7% wanted to keep the current state regulations. Suggested regulations included minimum length restriction (18.3%), reduced creel (12.8%), change in creel and minimum size restriction (24.3%), and a slot limit (22.7%). The two most popular regulations were presented at a second public meeting. They were:

1. A slot limit of 15-18" with a daily creel limit of 5 fish. Only one fish would be allowed over 21". Anglers participating in professional bass tournaments would be exempt in an effort to promote tournament popularity.
2. A 14" minimum size limit with a daily creel limit of 5 fish.

Harvest data from the creel survey suggested over exploitation of largemouth bass was not an issue. The majority of fish caught by anglers in 2000, 2001, and 2002 were released (76, 83, and 85%, respectively). LDWF fishery independent sampling results suggested that a minimum length regulation would have protected only a small percentage of harvested fish. A slot limit would have protected some larger fish from harvest, but the number of harvested fish was minimal. No regulation changes were implemented. Post hurricane regulation changes were also requested by anglers after both Hurricanes Katrina and Isaac. Proposed regulations included a five bass daily limit with a 14" minimum length limit regulation for three years.

On September 18, 2012, the St. Bernard Parish Council adopted Resolution SBPC #975-09-12, to request that LDWF consider reducing the daily creel limit of LMB in the waterways of St. Bernard and Plaquemines Parishes due to Hurricane Isaac. In response to the resolution, LDWF prepared a post Hurricane Isaac evaluation of LMB in Caernarvon ([APPENDIX VI](#)). Included in the report were data collected pre and post Hurricane Isaac. These data also describe post-storm population dynamics that were considered to be normal. No corrective management measures were recommended.

Recreational

Recreational fishing regulations including size and creel limits of fresh and saltwater species can be found on the LDWF website at: <http://www.wlf.louisiana.gov/fishing/regulations>

Commercial

Commercial fishing regulations for fresh and saltwater species can be found on the LDWF website at: <http://www.wlf.louisiana.gov/fishing/regulations>

FISH KILLS / DISEASE HISTORY, LMBV

Fish kills occur frequently in the upper area of the sub-basin due to tropical storm events. Hypoxic conditions typically result when excessive organic material is brought into suspension from the energy of the storm.

In 2002, 63 largemouth bass were collected using standard sampling methods and tested for largemouth bass virus. Six individuals (9.5%) tested positive for LMBV. Cell cultures were used to analyze samples.

CONTAMINANTS/POLLUTION

Fish consumption and swimming advisories for waterbodies within the basin can be found on the Louisiana Department of Environmental Quality's website at: <http://www.deq.louisiana.gov/portal/default.aspx?tabid=1631>

BIOLOGICAL

Fish samples

LDWF standardized electrofishing sampling was conducted in the Caernarvon Outfall area from 1992 – 2013 (Table 3). Standardized electrofishing samples, lead-net samples and rotenone samples were collected in the sub-basin in 2011, 2012, and 2013 for a special coastal project (Table 4). Beginning in 2015, thirty two standardized electrofishing samples and sixteen forage/fish assemblage samples were conducted at 16 stations in the sub-basin and will continue biennially (Table 5; [APPENDIX VII](#), Figure 1). Starting in 2017, portions of the Middle Pontchartrain Sub-Basin, including Pass Manchac, Ruddock, Bayou Trepagnier, and La Branche Wetlands will be added to the sampling regime (Table 5; [APPENDIX VII](#), Figure 1).

Table 3. LDWF standard sampling history in the Caernarvon Outfall from 1992 – 2013.

CAERNARVON OUTFALL SAMPLING	
1992	Electrofishing – 2-15 minute samples (spring)
1995	Electrofishing – 3-15 minute samples (spring) 4-15 minute samples (fall) 1-7.5 minute forage sample
1996	Electrofishing – 3-15 minute samples (spring) 2-15 minute samples (fall) 1-7.5 minute forage sample

1998	Electrofishing – 2-15 minute samples (spring) 2-15 minute samples (fall) 1-7.5 minute forage sample
1999	Electrofishing – 2-15 minute samples (spring) 4-15 minute samples (fall) 2-7.5 minute forage samples
2000	Electrofishing – 4-15 minute samples (spring) 4-15 minute samples (fall) 1-7.5 minute forage sample Creel Survey
2001	Electrofishing – 4-15 minute samples (spring) 4-15 minute samples (fall) 1-7.5 minute forage sample Creel Survey
2002	Electrofishing – 4-15 minute samples (spring) 4-15 minute samples (fall) 1-7.5 minute forage sample Creel Survey
2003	Electrofishing – 8-15 minute samples (spring)
2004	Electrofishing – 4-15 minute samples (spring) 4-15 minute samples (fall) 1-7.5 minute forage sample
2005	Electrofishing – 9-15 minute samples (spring)
2006	Electrofishing – 3-15 minute samples (spring) 4-15 minute samples (fall) Vegetation type map completed
2007	Electrofishing – 3-15 minute samples (spring) 3-15 minute samples (summer) 4-15 minute samples (fall) Vegetation type map completed
2008	Electrofishing – 2-15 minute samples (fall) 2-7.5 minute forage samples
2009	Electrofishing – 4-15 minute samples (spring) 4-15 minute samples (fall) 1-15 minute forage sample
2010	Electrofishing – 3-15 minute samples (spring) 4-15 minute samples (fall) 1-15 minute forage sample
2011	No sampling conducted
2012	No sampling conducted
2013	Electrofishing – 4-15 minute samples (spring) 4-15 minute samples (fall) 4 - 3.75 minute forage samples.

Table 4. LDWF special sampling history in the LPSB from 2011 - 2013.

Waterbody	Year	Sampling Gear	Number of Samples
River Aux Chenes (Oak River) - 42102	2011	Electrofishing	1
	2011	Leadnets	2

	2011	1 Day Rotenone	1
Lake Lery - 42105	2011	Electrofisch	5
	2011	Leadnets	10
	2011	1 Day Rotenone	4
	2012	Electrofisch	1
River Aux Chenes (Oak River) - 42102	2012	Leadnets	2
	2012	1 Day Rotenone	1
	2012	Electrofisch	5
Lake Lery - 42105	2012	Leadnets	10
	2012	1 Day Rotenone	4
	2013	Electrofisch	1
River Aux Chenes (Oak River) - 42102	2013	1 Day Rotenone	1
Lake Lery - 42105	2013	Electrofisch	5
	2013	1 Day Rotenone	4

Table 5. Scheduled sampling for LPSB and MPSB from 2015 – 2018.

Waterbody	Years	Sampling Gear	Number of Samples
042105 Lost Lake, Lake Lery, Caernarvon Diversion Outflow Canal, Delacroix Canal	2015 2018	Electrofisch / Forage	12 Electro/6 Forage
042102 Mardi Gras Pass, Spanish Lake, River Aux Chenes	2015 2018	Electrofisch / Forage	10 Electro/5 Forage
041801 Bayou Bienvenue, Dike Canal Marsh	2015 2018	Electrofisch/Forage	6 Electro/3 Forage
041803 Bushman Bayou	2015 2018	Electrofisch/Forage	2 Electro /1 Forage
041202 Bayou Trepagnier, 041201 La Branche Wetlands	2017	Electrofisch/Forage	6 Electro /3 Forage
041804 Bayou Dupre 040601 Pass Manchac, Ruddock	2015 2018	Electrofisch	2 Electro /1 Forage
	2017	Electrofisch/Forage	8 Electro /4 Forage

Lake records

No formal listing of water body records is kept.

Note: In February 1999, an 11.32 lb. largemouth bass that measured 24 inches in length was

caught in the Caernarvon area by a local fisherman. Genetic analysis was not conducted to determine if the fish was a Florida strain bass.

Stocking History

A total of 1,267,277 Florida largemouth bass were stocked in the Caernarvon Outfall from 1996 through 2008 (Table 6). No fish were stocked in the Caernarvon Outfall from 2009-2013 and no stocking requests were submitted for 2014, 2015 or 2016.

Table 6. Fish stocking history for the Caernarvon Outfall area

Species	Date	Size	Total
FLMB	11/20/1996	Fingerlings	39,000
FLMB	06/25/1997	Fingerlings	55,235
FLMB	04/07/1998	Adults	43
FLMB	05/13/1998	Fingerlings	101,223
FLMB	05/20/1998	Fingerlings	68,267
FLMB	05/20/1998	Fingerlings	4,535
FLMB	05/20/1998	Fingerlings	40,810
FLMB	05/20/1998	Fingerlings	28,768
FLMB	03/9/1999	Adv. Fry	300,000
FLMB	04/28/1999	Fingerlings	112,132
FLMB	05/21/1999	Fingerlings	148,824
FLMB	03/09/2000	Sac Fry	119,900
FLMB	04/14/2000	Fingerlings	51,612
FLMB	04/14/2000	Fingerlings	68,596
FLMB	12/12/2001	Phase II Fingerlings	322
FLMB	12/13/2001	Phase II Fingerlings	1,952
FLMB	12/19/2001	Phase II Fingerlings	1,650
FLMB	12/19/2001	Phase II Fingerlings	6,086
FLMB	01/15/2002	Phase II Fingerlings	1,520
FLMB	03/10/2003	Adults	173
FLMB	10/22/2003	Phase II Fingerlings	2,178
FLMB	01/23/2005	Phase II Fingerlings	400
FLMB	01/20/2005	Phase II Fingerlings	11,310
FLMB	01/27/2005	Phase II Fingerlings	3,000
FLMB	05/10/2006	Fingerlings	46,970
FLMB	05/10/2006	Fingerlings	23,184
FLMB	05/10/2006	Fingerlings	26,270
FLMB	05/20/2006	Adults	92
FLMB	10/09/2006	Phase II Fingerlings	998
channel catfish	10/16/2006	Fingerlings	5,503

bluegill	11/02/2006	Fingerlings	31,005
bluegill	11/02/2006	Fingerlings	9,192
bluegill	11/02/2006	Fingerlings	26,365
bluegill	11/02/2006	Fingerlings	44,622
FLMB	11/14/2006	Phase II Fingerlings	1,027
FLMB	01/11/2008	Phase II Fingerlings	1,200

Species profile

Table 7. Freshwater and brackish species common to the Big Mar and Caernarvon Diversion Outfall area

Freshwater Species	
<i>Lepomis miniatus</i>	red spotted sunfish
<i>Lepomis gulosus</i>	warmouth
<i>Lepomis microlophus</i>	redecor sunfish
<i>Lepomis macrochirus</i>	bluegill
<i>Pomoxis nigromaculatus</i>	black crappie
<i>Gambusia affinis</i>	western mosquitofish
<i>Micropterus salmoides</i>	largemouth bass
<i>Atractosteus spatula</i>	Alligator gar
<i>Lepisosteus oculatus</i>	spotted gar
<i>Lepisosteus osseus</i>	longnose gar
<i>Morone saxatilis</i>	striped bass
<i>Aplodinotus grunniens</i>	freshwater drum
<i>Amia calva</i>	bowfin
<i>Dorosoma petenense</i>	threadfin shad
<i>Dorosoma cepedianum</i>	gizzard shad
<i>Ictiobus bubalus</i>	smallmouth buffalo
<i>Ictiobus cyprinellus</i>	bigmouth buffalo
<i>Ictalurus furcatus</i>	blue catfish
<i>Ameiurus natalis</i>	yellow bullhead
<i>Ictalurus punctatus</i>	channel catfish
<i>Herichthys cyanoguttatus</i>	Rio Grande cichlid
<i>Hypophthalmichthys molitrix</i>	Silver carp
<i>Hypophthalmichthys nobilis</i>	Bighead carp
Brackish Marsh Species	
<i>Cynoscion nebulosus</i>	spotted seatrout
<i>Paralichthys lethostigma</i>	southern flounder
<i>Sciaenops ocellatus</i>	red drum

<i>Pogonias cromis</i>	black drum
<i>Poecilia latipinna</i>	sailfin molly
<i>Menidia beryllina</i>	inland silverside
<i>Cyprinodon variegatus</i>	sheepshead minnow
Anadromous Species	
<i>Acipenser oxyrinchus desotoi</i>	Gulf sturgeon
Invertebrate Species	
<i>Callinectes sapidus</i>	blue crab
<i>Litopenaeus setiferus</i>	white shrimp
<i>Farfantepenaeus aztecus</i>	brown shrimp
<i>Crassostrea virginica</i>	American oyster

Genetics

Genetic analysis was conducted on largemouth bass samples collected in the Caernarvon area during 1997, 1999, 2000, 2002, and 2007 electrofishing samples. Allozyme starch gel electrophoresis analyses were conducted at the Louisiana State University School of Renewable Natural Resources.

Threatened/endangered/exotic species

Bighead carp (*Hypophthalmichthys nobilis*) and Silver carp (*Hypophthalmichthys molitrix*) are present in the LPSB. Sampling is being conducted to determine if these species has established a sustained population within the basin.

A deceased manatee (*Trichechus manatus latirostris*) was reported in the LPSB at the following coordinates: 29.82381, -89.89046.

On January 25, 1994 a 42 lb. Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) measuring 57 inches total length was caught, tagged and released in the southeastern part of Caernarvon near Delacroix. The tagged fish was never relocated. There is record that an unsuccessful attempt to track the fish by plane was made on August 2, 1994. The Gulf Sturgeon is a threatened species in the United States.

CREEL

Type of Creel

Access point interview (public boat ramp @ Hwy 39).

Historic information

A creel survey was conducted in the Caernarvon area from 2000-2002 (3 full calendar years). The calendar months were divided into light and peak fishing periods as shown in Table 9. The creel start time, 2 hours after sunrise (am) or 4 hours before sunset (pm), was chosen randomly. All anglers passing through the access point were surveyed and trailer counts were made once throughout the five hour duration.

Table 9. Creel schedule for the Caernarvon Diversion Outfall area from 2000-2002.

Month	Fishing Pressure	Total # of Days	# of Weekend days	# of Weekdays	Survey Duration (hours)
January	peak	6	4	2	5
February	peak	6	4	2	5
March	peak	6	4	2	5
April	light	3	2	1	5
May	light	3	2	1	5
June	light	3	2	1	5
July	light	3	2	1	5
August	light	3	2	1	5
September	light	3	2	1	5
October	peak	6	4	2	5
November	peak	6	4	2	5
December	light	3	2	1	5

Current methods

There is no creel survey in the Caernarvon area at this time.

WATER USE

Hunting

The Caernarvon area is a popular destination for hunting waterfowl and other game. The Delacroix Corporation leases the majority of their land to duck hunters.

Fishing

Largemouth bass fishing is popular in the Caernarvon area, especially for tournament fishermen. However, increased siltation and presence of aquatic vegetation is making it increasingly difficult to access fishing locations.

Trapping

Alligator harvesting is an important industry in this area and since the opening of the diversion the number of alligator nests increased by 153%.

Literature Cited

Army Corps of Engineers New Orleans District 2012 Mississippi River Gulf Outlet Ecosystem Restoration Plan Final Feasibility Report 2012 U.S.

Carter, B. 2003. Monitoring Plan for Caernarvon Diversion Outfall Management (BS-03a). Louisiana Department of Natural Resources. Baton Rouge, Louisiana. 21pp.

Lake Pontchartrain Basin Foundation (LPBF).2006. Comprehensive Habitat Management Plan for the Lake Pontchartrain Basin.

Lopez, John. 2014. Evolution of Mardi Gras Pass within the Bohemia Spillway of the Mississippi Delta in Southeast Louisiana: March 2012 through December 2013

Louisiana Department of Natural Resources (LDNR). 2003. Caernarvon Freshwater Diversion Project Annual Report 2002. Louisiana Department of Natural Resources. Baton Rouge, Louisiana. 30pp.

State of Louisiana Coastal Protection and Restoration Authority (CPRA) 2011 Operations, Maintenance, and Monitoring Report for Caernarvon Diversion Outfall Management (BS-03a)

van Beek, J. L., D. W. Roberts, T. J. Duenckel, D. Davis, D. Sabins, and S. M. Gagliano. 1982. Recommendations for Freshwater Diversion to Louisiana Estuaries East of the Mississippi River. Louisiana Department of Natural Resources. Baton Rouge, Louisiana. 49 pp.

APPENDIX I

[\(return to LPSB\)](#)



Figure 1. The Pontchartrain Basin within Louisiana's boundaries'.



Figure 2. The Lower Pontchartrain Sub-Basin.



Figure 3. The Bayou Bienvenue Central Wetlands Unit.



Figure 4. The Caernarvon / Delacroix Unit.

APPENDIX II

[\(return to Big Mar\)](#)

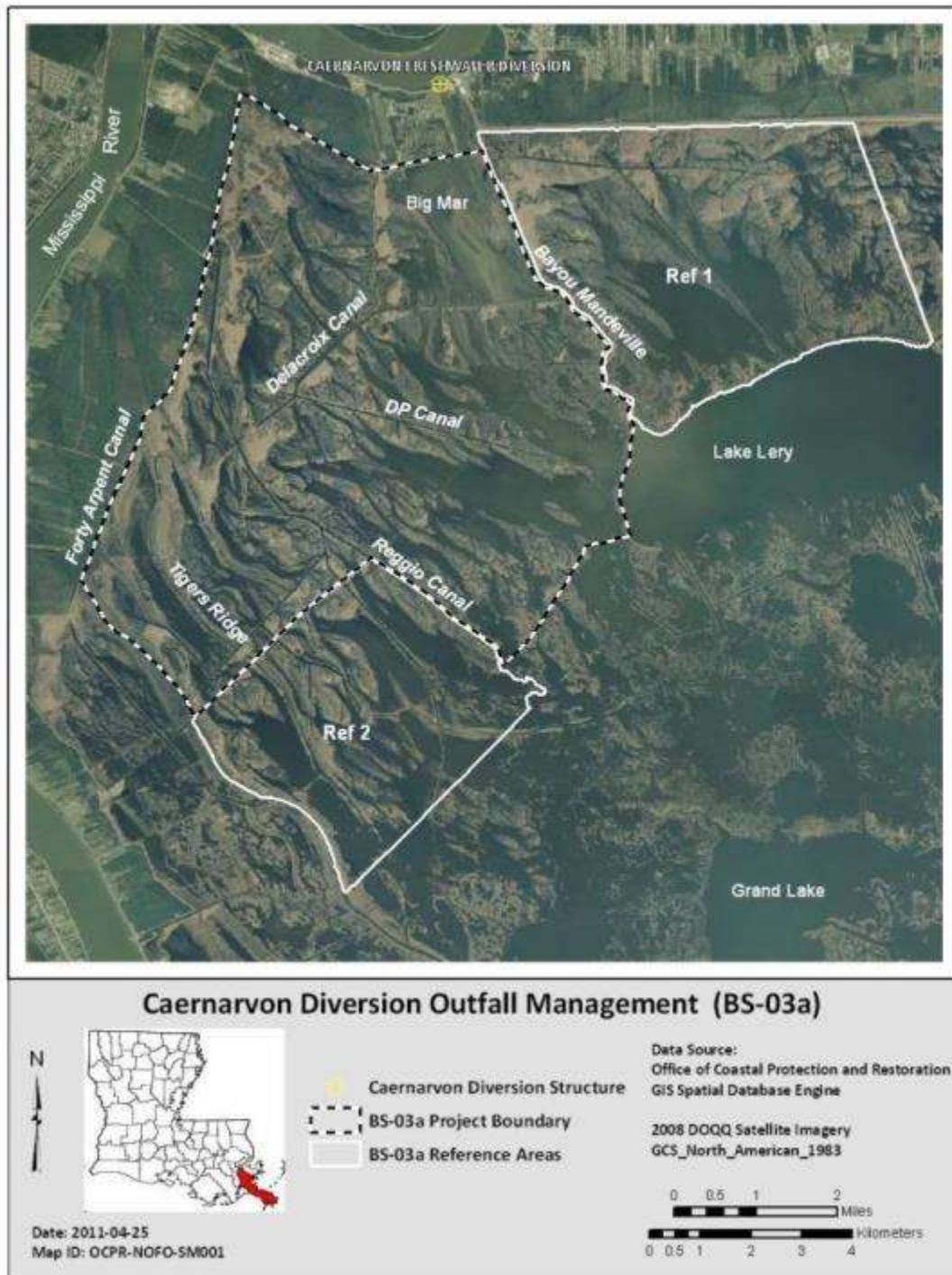


Figure 1. Caernarvon Diversion Outfall Management area.

APPENDIX III

([return to Caernarvon](#))

CAERNARVON OPERATIONAL PLAN 2016

From December through May, the intent is to operate the diversion to maintain the seasonal average salinity at the 15 ppt line illustrated in the map below. A salinity gauge has not existed at the 15 ppt isohaline line, though one was installed closer to the line in May 2014 (USGS gauge #073745275, Black Bay near Stone Island). Salinities at the Stone Island gauge will continue to be monitored in 2016, though December-May operations will be primarily based on data from the Black Bay gauge specified by the map (Figure 1) and graph below (Figure 2). From June through November, Caernarvon operations will be based on the monthly salinity range at the 5 ppt line specified by the map (Figure 1) and graph (Figure 3) below, utilizing the Crooked Bayou gauge. The structure will be operated when the 14-day moving average salinity is within or above the long term data range for the gauge(s) in use. When the moving average drops below the low trigger (the greater of the long term average minus 1SD or 5ppt), the diversion operations will be ceased until the moving average re-enters the operational range*. Operational settings are not to exceed 7500 cfs.

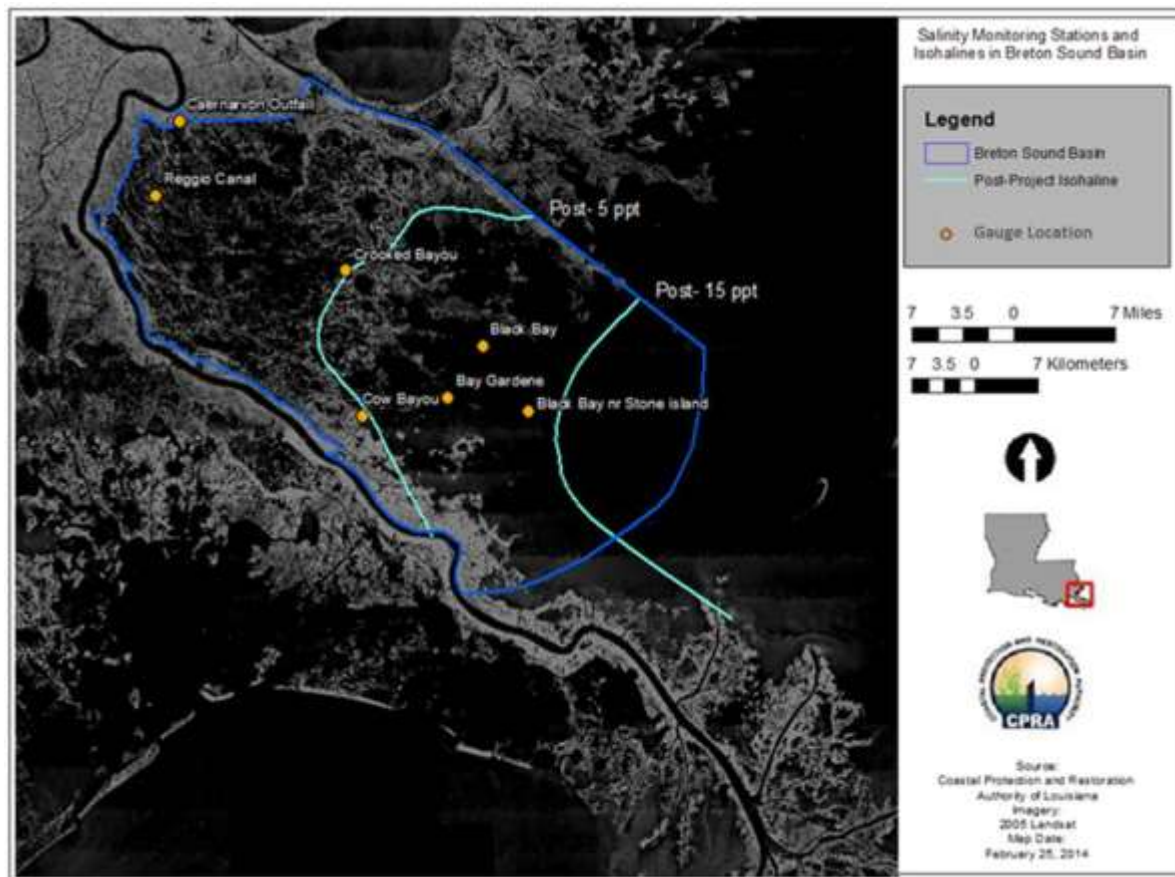


Figure 1. Map of salinity gauges and isohaline lines in Breton Sound basin to be used for guidance and operation of the Caernarvon Freshwater Diversion.

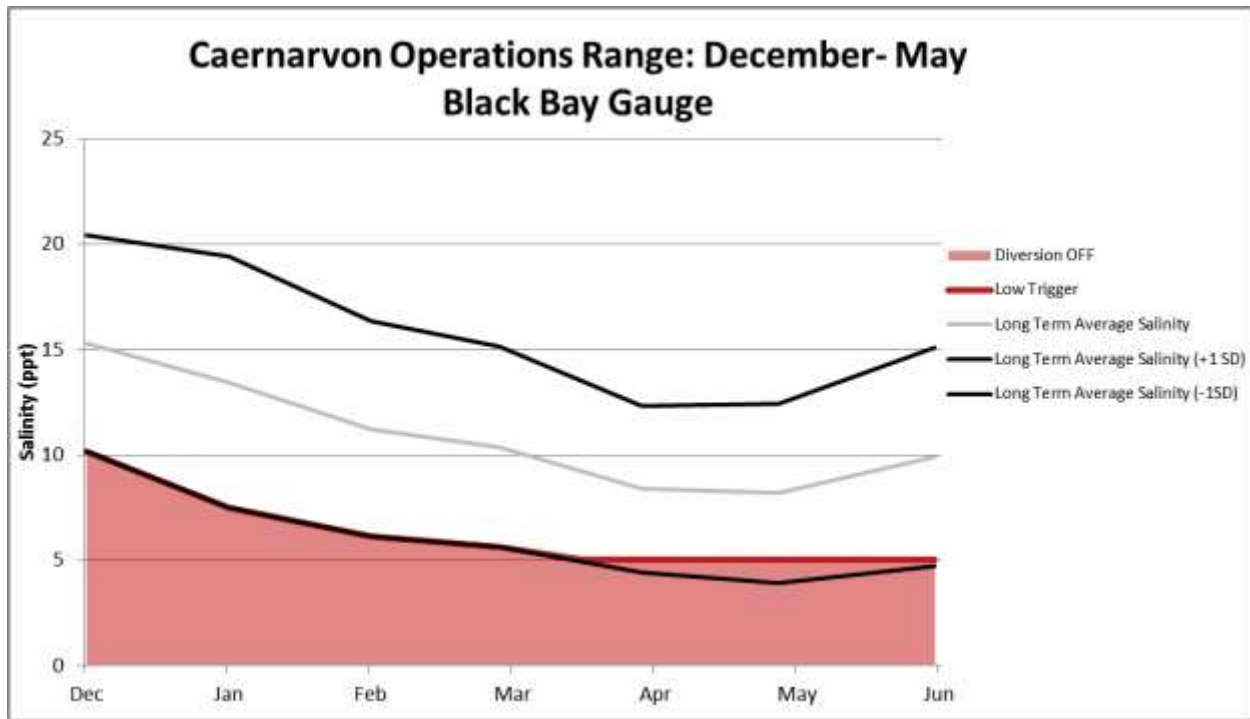


Figure 2. Long term average (+1 standard deviation) salinities from the Black Bay Gauge (USGS site 07374526). From December through May, the Caernarvon Freshwater Diversion structure maybe operated when the 14-day moving average salinity is within or above the data range. Operations will cease if the moving average drops below the low trigger.*

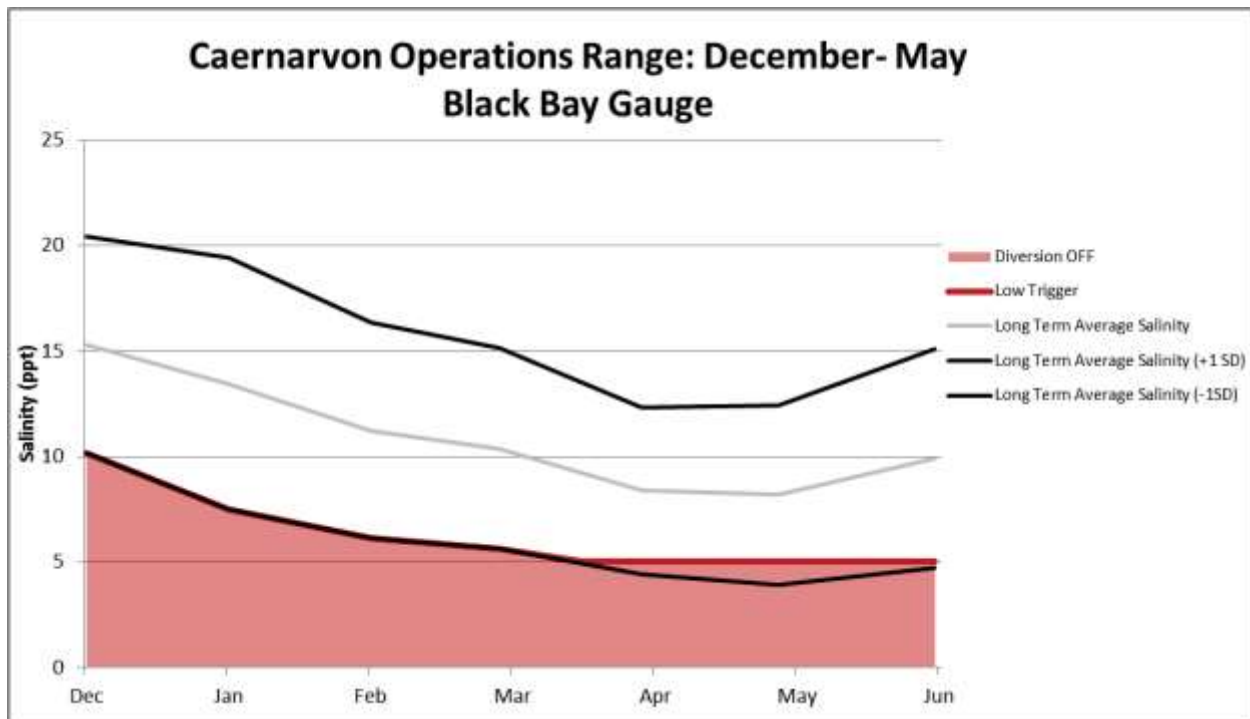


Figure 3. Long term average (+1 standard deviation) salinities from the Crooked Bayou (USGS site 073745257) and Cow Bayou (USGS site 073745258) gauges. From June through November

the Caernarvon Freshwater Diversion structure maybe operated when the 14-day moving average salinity is within or above the data range. Operations will cease if the moving average drops below 5ppt.*

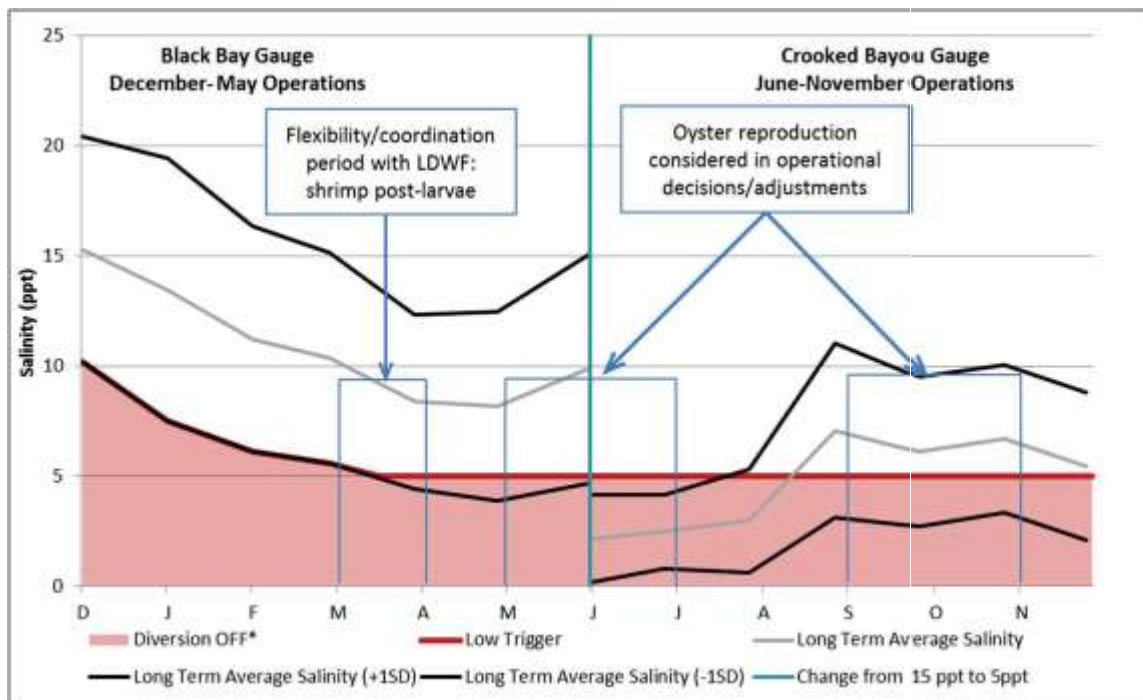


Figure 4. Long term average (+1 standard deviation) salinities from the Black Bay Gauge (USGS site 07374526). From December through May, and the Crooked Bayou (USGS site 073745257) gauge from June through November.

The Caernarvon Freshwater Diversion structure maybe operated when the 14-day moving average salinity is within or above the data range. Operations will cease if the moving average drops below the low trigger. Blue boxes indicate timeframes of species-specific considerations.*

*Discharges may deviate from operational plan as outlined below:

- Emergency, maintenance and local parish situations will be evaluated on a case-by-case basis to determine operational needs. The CIAC shall be notified if operations outside of the plan are required.
- Structure may be operated for public relations and/or educational purposes, though output is notto exceed 5000 cfs for duration of no longer than 2hours.
- Coordination with LDWF during post-larval brown shrimp migration period and oyster reproductive seasons to assist in operational decisions/adjustments to maximize benefits.

APPENDIX IV
([return to access](#))

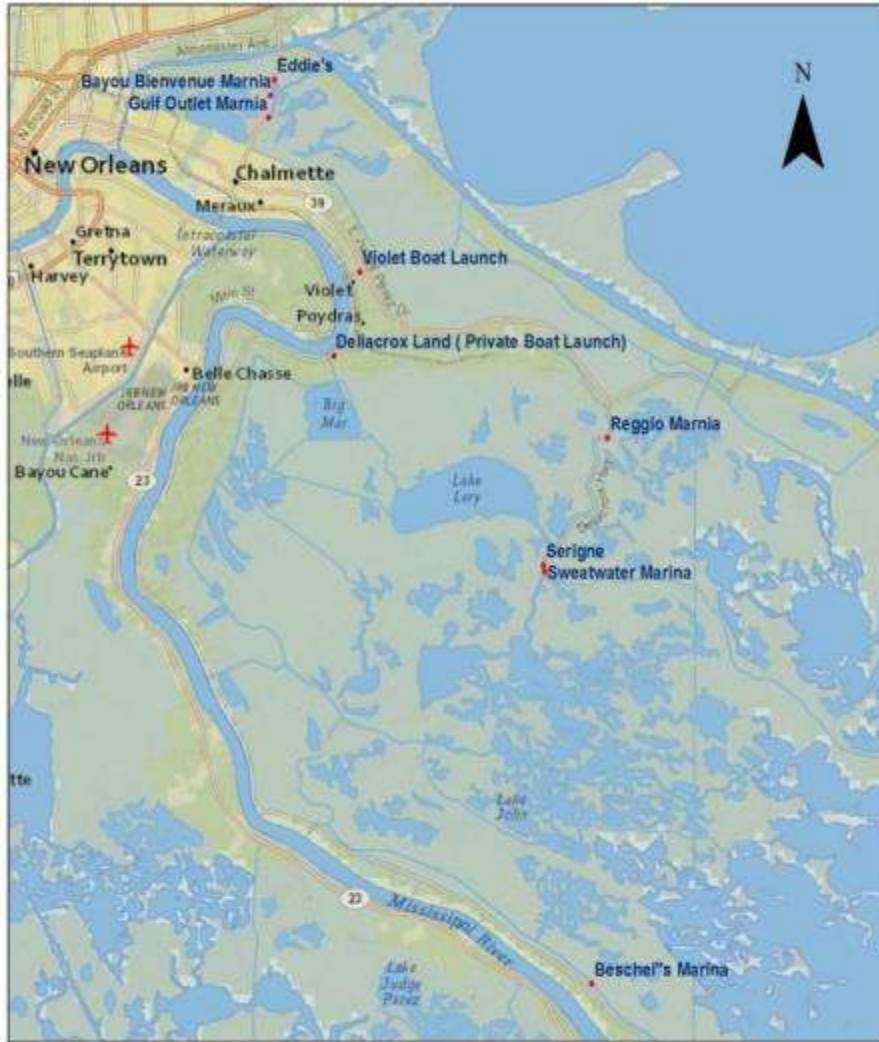


Figure 1. The Lower Pontchartrain Sub-basin boating access.



Figure 2. Pre- and post-Katrina satellite imagery showing changes to the Caernarvon area from the storm.

APPENDIX V
([return to bayou](#))

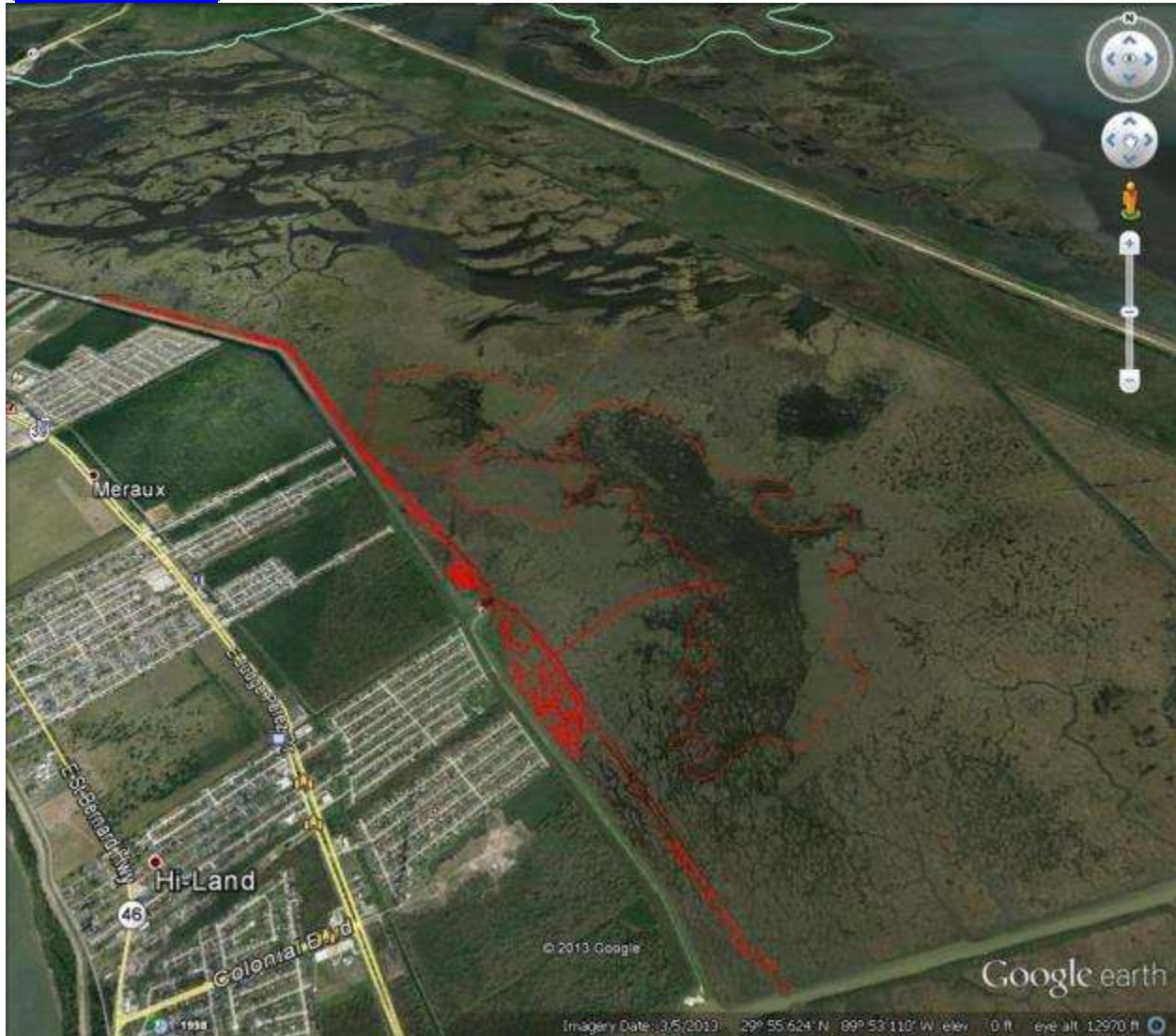


Figure 1. Approximately 800 acres of giant salvinia located in the marsh east of Bayou Bienvenue in November of 2013.



Figure 2. Vegetation type map of the Caernarvon / Delacroix management unit surveyed in the fall of 2015.

APPENDIX VI

[\(return to LDWF\)](#)

LOUISIANA DEPARTMENT OF WILDLIFE & FISHERIES
Office of Fisheries
Post Hurricane Isaac Evaluation of Largemouth Bass in Caernarvon Louisiana
March 25, 2013
Louisiana Department of Wildlife and Fisheries
P.O. Box 98000, Baton Rouge, LA 70898

Post Hurricane Isaac Evaluation of Largemouth Bass in Caernarvon Louisiana

Tropical Storm reached hurricane strength on the morning of August 28, 2012 and made its first U.S. landfall with winds of 80 mph near the mouth of the Mississippi River. It made a second landfall at Port Fourchon. The storm produced a relatively large storm surge and was responsible for widespread fish kills. Louisiana Department of Wildlife and Fisheries personnel conducted 17 Hurricane Isaac related fish kill investigations between August 29, 2012 and September 13, 2012. Though some kills were significant, most were relatively minor with dead fish reported as less than a few hundred.

Post-Isaac data was reviewed to document the effects of the storm and to evaluate the subsequent general health of the recreational fishery. Largemouth bass (*Micropterus salmoides*) were targeted as a species indicator for the overall fish population due to their high position in the food chain.

Sampling

Louisiana Department of Wildlife and Fisheries (LDWF) initiated a Coastal Marsh Sampling project in 2011 for areas that include freshwater marsh east of the Mississippi River (Lost Lake, Lake Lery, Oak River, Big Mar, Crows Foot). As per LDWF protocol, sampling is conducted in the fall months, at established sampling sites, in a standardized manner. Largemouth bass sampling is primarily conducted with electrofishing gear. Sampling conducted in Fall 2011 provides baseline data to establish a pre-Isaac fish population. Sampling was conducted approximately one month after the landfall of Hurricane Isaac in 2012. In March 2013, electrofishing sampling was conducted at established sites in the Big Mar vicinity (including Crows Foot) and at a new sampling site near the Scarsdale pumping station.

Results

Catch per unit effort (CPUE) for largemouth bass (LMB) is provided in Figure 1. In contrast to some expectations, the results indicate a 33% increase in LMB abundance from 2011 to 2012 (28.8 bass/hr to 43.2 bass/hr). An additional 6% increase in abundance is indicated from sampling conducted in spring 2013 (43.2 bass/hr to 46 bass/hr). Figures 2, 3, and 4 provide a description of largemouth bass size distribution. Catch rate is sorted by inch groups to provide a size distribution model of the population at the time of sampling. The fall 2011 length distribution of the bass population ranged from 4 to 16 inches with strong representation from the 9-10 inch size groups. Though conducted only one month after Hurricane Isaac, sampling results from fall 2012 describe a population size structure similar to the pre-storm population. LMB ranged in size from 4 to 17 inches and increased abundance of 10-12 inch bass is noted. The change is considered to be an improvement for anglers and is likely due to growth of the 9-10 inch cohort observed in 2011 sampling. In March 2013, the LMB sample population ranged from 5 to 17 inches with reasonably strong representation of 12-13 inch bass.

Conclusion

Observed changes include an increase in abundance for each of the two post-storm samples. The data also describe post-storm population dynamics that can only be attributed to a normal bass population. Largemouth bass abundance increased, instead of an expected decrease due to effects of the storm. Bass population size structure changed through the study period to include more individuals in larger size groups. Adult and juvenile LMB were well represented in the samples indicating that successful spawning and recruitment has occurred. No corrective management measures are currently required nor recommended. LDWF is scheduled to continue monitoring of coastal fish populations annually. The next sampling effort is scheduled for fall 2013.

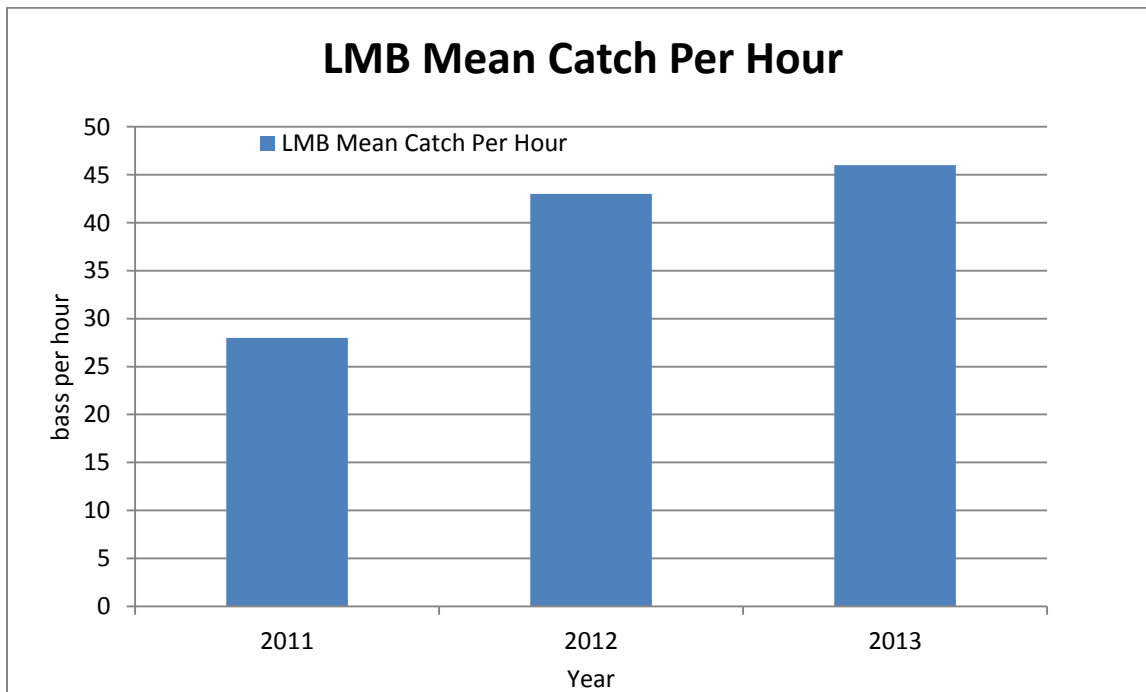


Figure 1. Mean catch per unit of effort for largemouth bass in the Caernarvon, Braithwaite, and Delacroix marshes.

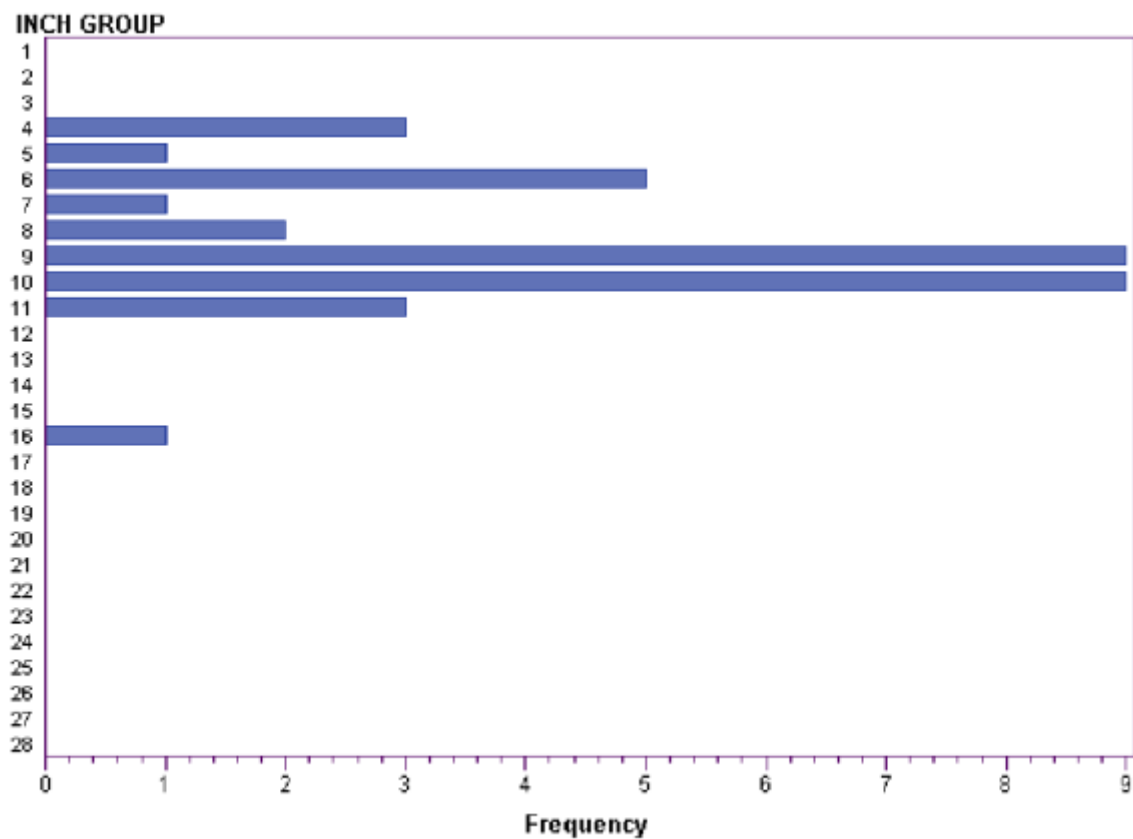


Figure 2. Size distribution for largemouth bass collected by electrofishing in the Caernarvon, Braithwaite, and Delacroix marshes in the fall of 2011. N = 29.

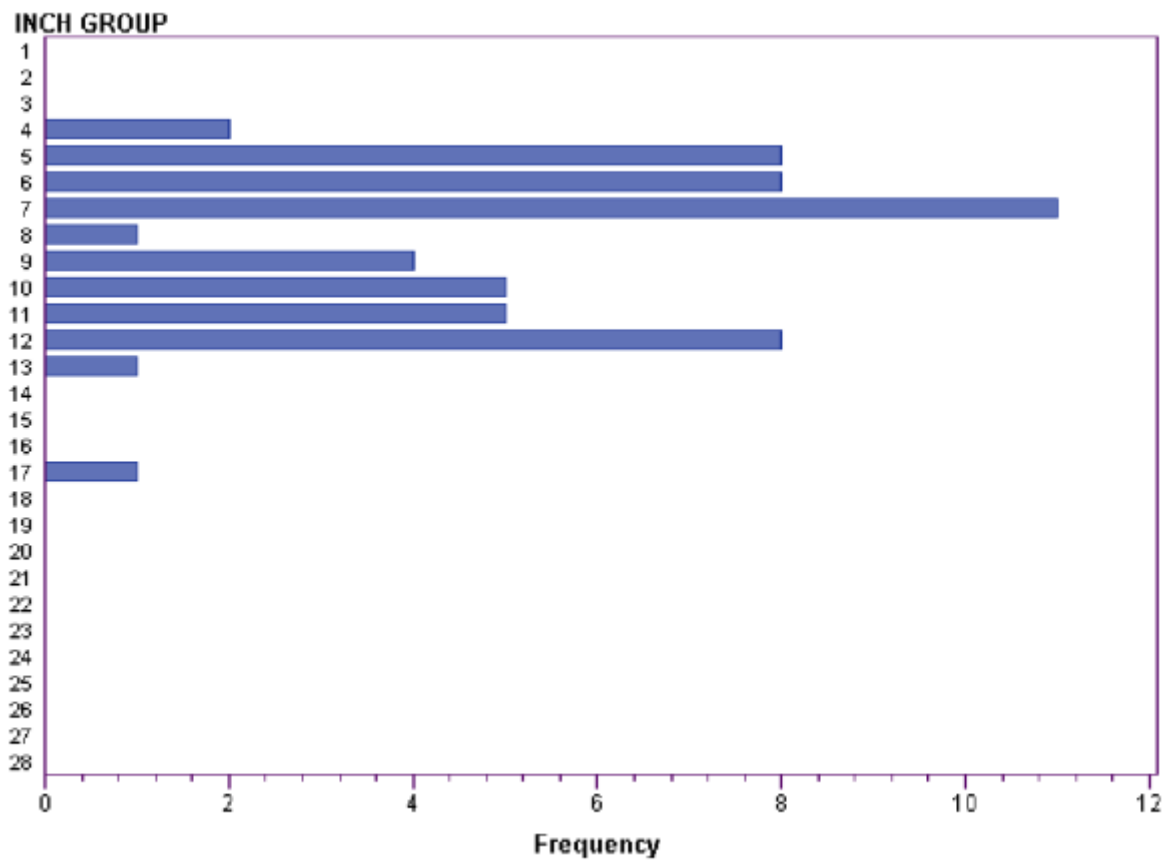


Figure 3. Size distribution for largemouth bass collected by electrofishing in the Caernarvon, Braithwaite, and Delacroix marshes in the fall of 2012. N = 43.

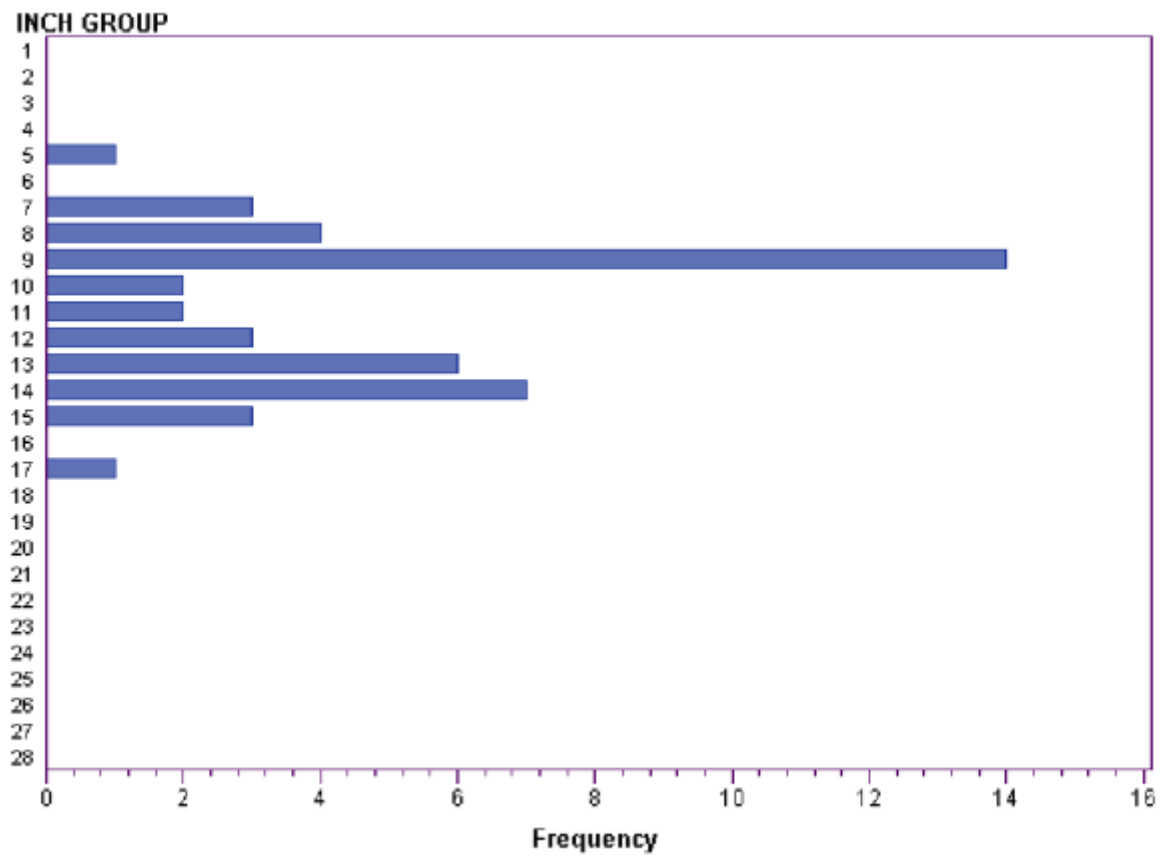


Figure 4. Size distribution for largemouth bass collected in the Big Mar area in the spring of 2013. N = 46

APPENDIX VII
([return to fish](#))

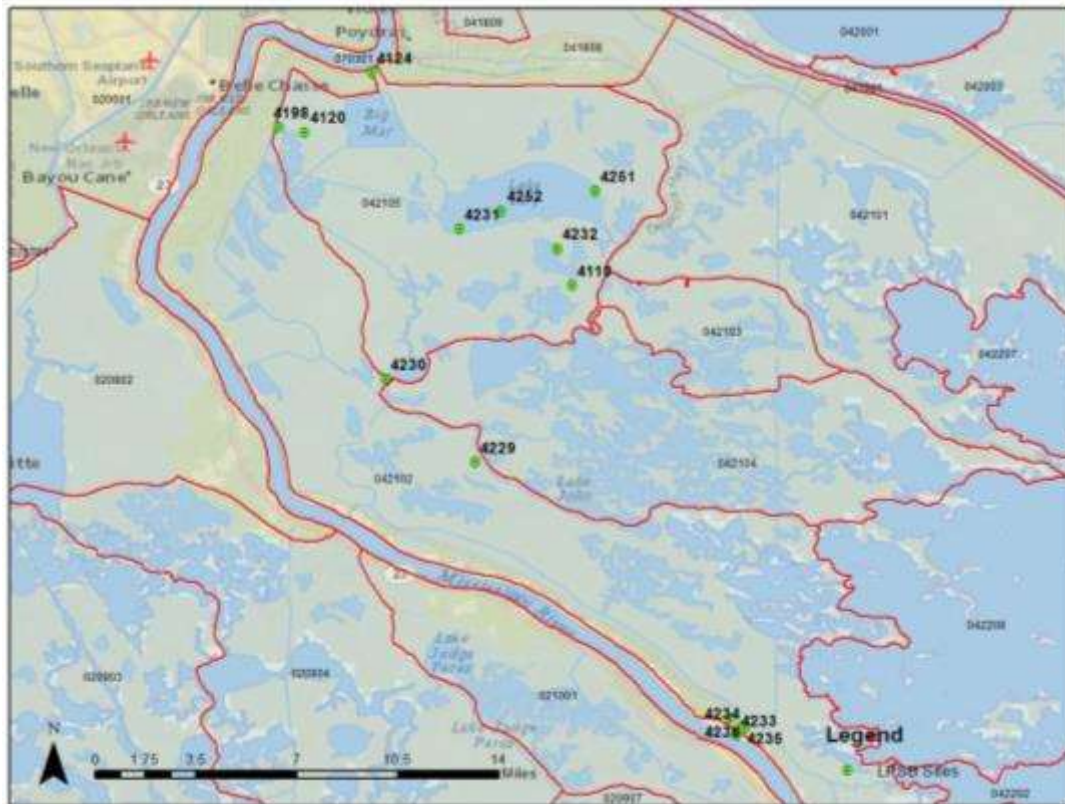


Figure 1. LDWF electrofishing sample stations in the LPSB

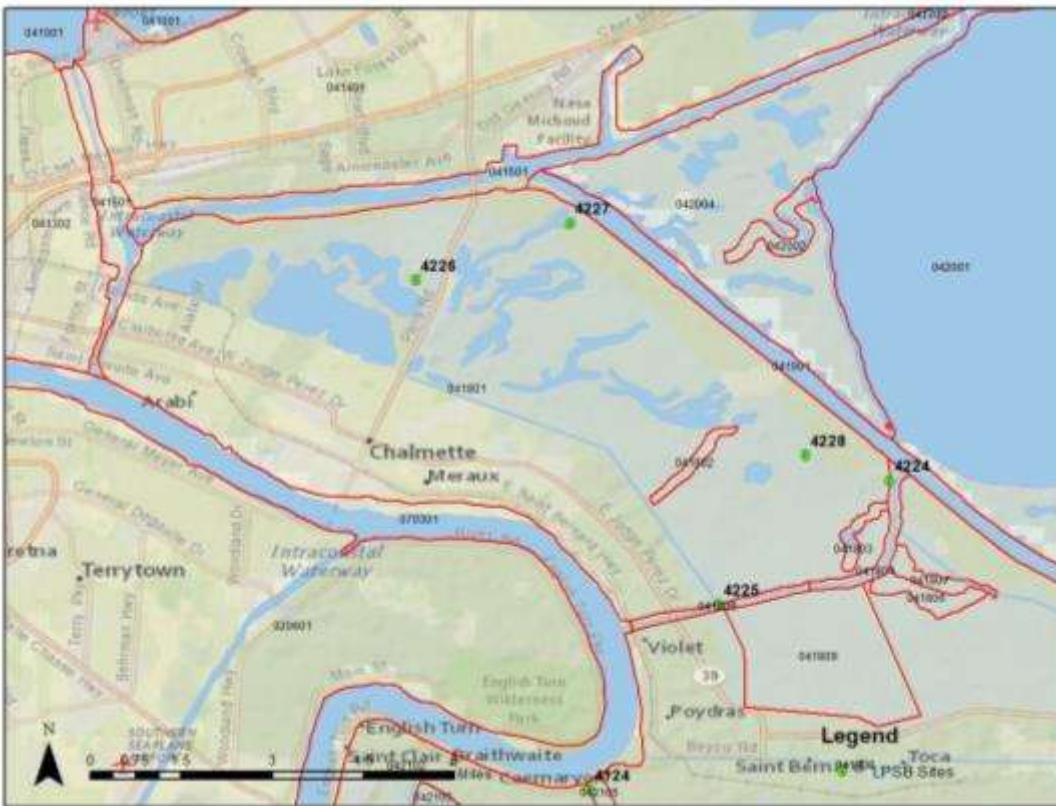


Figure 2. LDWF electrofishing sample stations in the LPSB.